

REMARKS

Favorable reconsideration and allowance of this application are requested.

By way of the amendment instructions above, claims 62 and 63 directed to a patentably distinct invention non-elected by virtue of original prosecution have been cancelled. However, cancellation of such claims has been effected without prejudice to the applicants' rights under 35 USC §121.

Claims 64 and 65 are new and are dependent from claims 53 and 58, respectively. Each of new claims 64 and 65 is based on the disclosure in the originally filed specification at page 5, lines 26-30, for example.

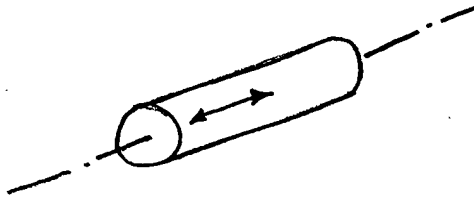
Claims 53-61 and 64-65 are therefore pending in this application for which favorable reconsideration and allowance are solicited.

I. Response to 35 USC §112 Rejection

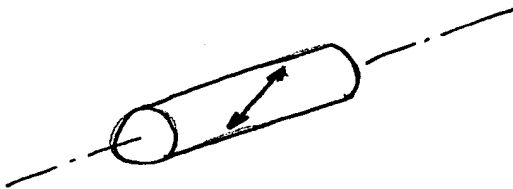
Many of the originally presented claims have been amended in an effort to clarify the claim language and to address the Examiner's rejection advanced under 35 USC §112. In this regard, the Examiner will note that claims 53 and 58 now recite that the elongate tubular heat transfer element has a longitudinal tube axis and comprises a wall defining a hollow interior which extends longitudinally of the tube axis of the heat transfer element. In addition, claims 53 and 58 have been revised so as to clarify that the wall is formed of a "composite material" with the "composite material" being comprised of a "matrix" and "rovings" embedded in the matrix. The matrix in turn consists essentially of the recited fluoropolymer. Hence the rejection advanced against claims 53 and 58 under 35 USC §112 is believed to be moot.

With regard to claims 55 and 59, the Examiner will note that the objected-to terminology has been deleted. Moreover, applicants have amended the language

relative to the directionality of the claimed embedded rovings to clarify that, in one case the rovings may be oriented longitudinally in a lengthwise direction relative to the tube axis as shown below:



while in the other case, the rovings may be oriented so as to extend spirally around the tube axis as shown below:



The relative directionality of the embedded rovings is therefore clearly recited in the pending claims herein and is understandable to even those with less than ordinary skill in the art. The terms "longitudinal" and "spirally" are mutually exclusive of one another. Specifically, as noted above, a "longitudinal" orientation of the rovings is in a lengthwise direction relative to the tube axis (shown by the chain line in each sketch), whereas a "spiral" orientation of the rovings is at an angular bias relative to the tube axis. The language employed in the claims is submitted to be entirely clear in this respect. As such, withdrawal of the rejections advanced against the claims for this reason is likewise in order.

The language of claims 56 and 60 has been revised so as to adopt generally the acceptable language employed in claims 55 and 59 with respect to the recited first, second and intermediate layers.

It is believed that all issues advanced by the Examiner under 35 USC §112 have been addressed and overcome. As such, withdrawal of such rejection is solicited.

II. Response to Art-Based Rejections

The only issue remaining to be resolved in this application is the Examiner's persistence that claims 53-61 are "obvious", and hence unpatentable, under 35 USC §103(a) over Swozil et al. Applicants have already pointed out in previous prosecution that the arrangement described in Swozil is completely different to that claimed in the present application. Although applicants have already explained much to the Examiner in this respect, it may be helpful to again revisit the various issues presented by the application of Swozil as a reference against the presently pending claims.

The Examiner has suggested that the fiber layer taught by Swozil corresponds to the "wall" of the present application. However, with all due respect to the Examiner, applicants believe that his analysis is flawed. In this connection, applicants would remind the Examiner that the wall as defined in the presently pending claim defines or establishes the hollow interior of the tube. In contrast, the fiber layer of Swozil is coated around a tube body to form a temperature and corrosion-resistant layer on the tube body. In this connection, the Examiner's attention is directed to column 1 lines 57 to 65 which describes the process for making the tube of Swozil. It is also noted that column 1, line 41 states that the corrosion resistant layer **covers** the tube. Thus it will be understood that the fiber layer of Swozil, even if it defines a wall, is **not** a wall as defined in Claims 53 and 58 of the present application since it does not define a hollow interior.

It will be understood that the tube wall of the present invention is of a monolithic construction and that the inner surface of the wall **defines** the hollow interior. In contrast, the arrangement of Swozil can be regarded as a conventional tube having a "bandage" layer around the exterior of the tube.

The Examiner has suggested that the wall of Swozil is of monolithic construction. While it is not accepted that the wall (as defined by the Examiner) of Swozil is of monolithic construction, applicants would respectfully draw to the Examiner's attention the fact that the tubular heat transfer element as defined in the present invention has a wall which **defines** the hollow interior. It is the **wall which defines the hollow interior** that is of monolithic construction according to the present invention. The portion of the Swozil arrangement which the Examiner has identified as being of monolithic construction is not the "wall" as that term is employed in the context of the present invention.

The rearrangement of some of the claim terms with regard to the wall being monolithic and having outer and inner surfaces and that it is the inner surface of the wall which defines the hollow interior should assist the Examiner in his understanding of the differences noted above with respect to Swozil.

The Examiner has suggested that Swozil teaches a wall comprising a composite material consisting essentially of a matrix of polyvinylidene fluoride having rovings of boron-free chemically resistant glass fibers embedded in the matrix. With due respect to the Examiner, his analysis of Swozil is inaccurate and formulated with the benefit of hindsight. Applicants would remind the Examiner that Swozil should be read as it would have been understood at the priority date of the present invention by a skilled man without the benefit of the knowledge of the present invention.

Applicants would first remind the Examiner that Swozil at Column 2 lines 12 to 18 state:

"....the concept underlying the invention is to improve tubes used in shell and tube heat exchangers in a mechanical manner, by covering the tubes with a fiber layer, since the tubes themselves are formed of a fluorine-containing thermoplastic which **cannot be reinforced by incorporation of fibers in practice**, due to the very difficult processing which would be required." (emphasis added)

Thus, Swozil specifically teaches away from the arrangement of a composite material which comprise a matrix of a fluropolymer in which fiber rovings are embedded as defined in the claims pending herein.

The wall of the tube of Swozil which defines the hollow interior is therefore not formed from a "composite material" as defined in the presently pending claims. Even if one were to look at the "bandage" layer of Swozil, this does not teach or suggest the arrangement of the present invention.

The Examiner does not appear to understand the meaning of the term "matrix" as used in the context of composite materials. In this connection applicants would remind the Examiner that the definition of "Matrix" is:

"As applied to polymer matrix materials, [a matrix] is the resinous phase of a reinforced plastic material in which the fibers or filaments of a composite are embedded".
Dictionary of Composite Material Technology available at

<http://composite.about.com/library/glossary/m/bldef-m3243.htm> .

The "bandage" layer of Swozil does **not** include a matrix into which the fibers are embedded. In contrast, the tube itself is formed by fibers which are simply coated with a fluorine-containing polymer. Applicants would also draw the Examiner's attention to column 3 lines 20 to 50 in this regard. In the case where the "bandage" is wrapped around the tube it is described as a "yarn" and in the second case where the "bandage" is pre-formed and pulled onto the outer surface of the tube, the material is described as a "fabric" which may have a mesh of varying size. It will be understood that these are **not** composite materials comprising a matrix having rovings embedded therein.

Applicants would also remind the Examiner that the application at issue is directed to the skilled man. Such a skilled man would understand the terms of art associated with composite materials and would give the terms in the claims their true meaning within the art. He would equally readily understand that the material described in Swozil is **not** a composite material as it does not comprise a matrix having rovings embedded therein.

The Examiner has suggested that since Swozil is silent as to whether the glass fibers referred to therein contain boron or are boron-free, then Swozil must teach both. In connection with the fibers of Swozil, applicants would first respectfully remind the Examiner that the majority of Swozil relates to the use of carbon fibers. In one line of Swozil (column 3 line 2) there is a reference to the possibility of using other fibers ie ceramic fibers, glass fibers or aramide fibers. In view of the range of ceramic fibers and aramide fibers available, the skilled man is provided with a large list of possibilities to select from.

At the priority date of the subject application, there was technical prejudice against the use of glass fibers with fluorine-containing polymers due to problems associated with fabrication. The applicants have already provided the Examiner with reference to one fatal accident which resulted from attempts to use glass fibers with such polymers. In view of this, the skilled man was likely to discount the glass fibers in favor of the other fibers referred to in Swozil. Thus, there was no motivation to select the glass fibers from the list. Further, there was a positive deterrent not to choose the glass fibers. Further there is nothing in Swozil to teach the skilled man that, out of the various numerous types of glass fibers, he should select one particular type and that in doing so, he would achieve the surprising result of the present invention. To assert otherwise is to resort to impermissible hindsight viewing of Swozil.

The Examiner has also suggested that Swozil teaches that the rovings extend substantially in the length of the heat transfer element. With due respect to the Examiner, applicants believe that this analysis is completely flawed. There is no suggestion in Swozil at all that the fibers should do anything but be angled to the axis of the element. In this connection, applicants again ask the Examiner to refer to the comments above relating to the meaning of the term longitudinal and the orientation of embedded rovings relative to the tube axis. The fibers of Swozil are all spirally oriented relative to the tube axis.

Thus in summary, Swozil does not teach at all a composite material comprising a matrix and having rovings embedded therein. Swozil further does not teach that, of all the fibers identified, that a particular benefit would or even could be achieved by the selection of glass fibers against all of the prejudice in the art.

Swozil further does not teach or even remotely suggest that boron-free fibers should be used.

DODD et al
Serial No. 09/890,860
August 20, 2004

Furthermore, Swozil does not teach that the particular volume of fibers which should be used as defined in the present invention nor that the composite should include rovings which extend substantially in the length of the tube and rovings which extend spirally around the tube axis.

Finally, Swozil does not teach that the wall which defines the hollow interior of the tube should be of monolithic construction. In view of these substantial differences between Swozil and the present invention, it is apparent that there is nothing in Swozil which would lead the skilled man to the present invention and as such the claims of the application are unequivocally un-obvious over Swozil.

Withdrawal of the rejection advanced under 35 USC §103(a) based on Swozil is therefore in order.

Every effort has been made to advance prosecution of this application to allowance. Therefore, in view of the amendments and remarks presented above, applicants suggest that this application is in condition for allowance and prompt receipt of the Official Notice thereof is solicited.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: 

Bryan H. Davidson
Reg. No. 30,251

BHD:Imy
1100 North Glebe Road, 8th Floor
Arlington, VA 22201-4714
Telephone: (703) 816-4000
Facsimile: (703) 816-4100